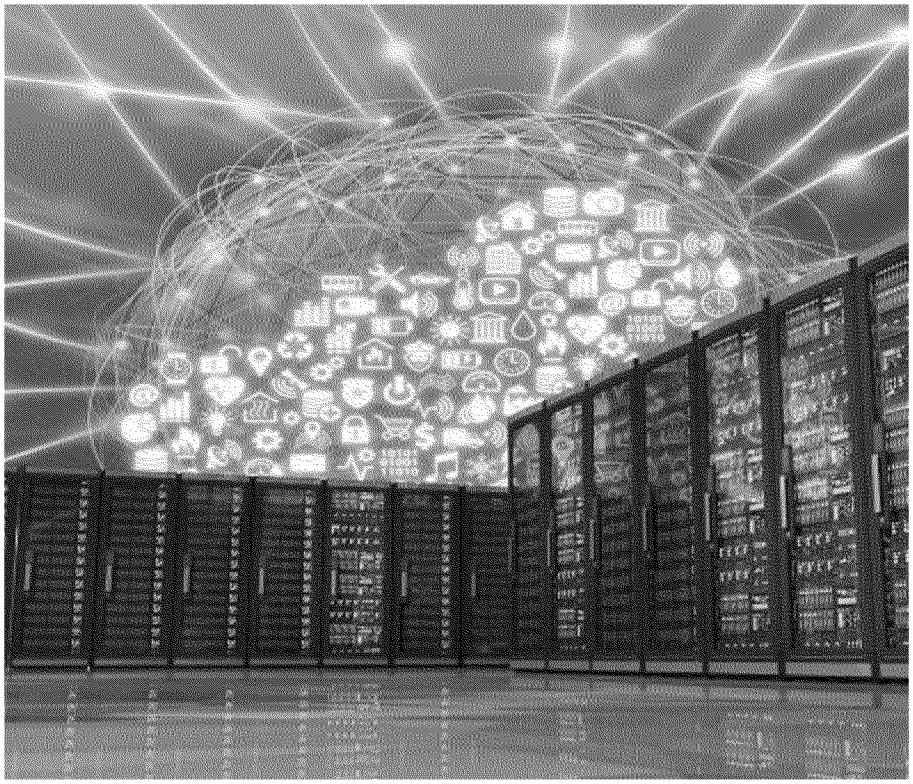

Laboratory and Data Management Statement of Qualifications

Glenn Springs Holdings, Inc.

GHD | 2055 Niagara Falls Boulevard Niagara Falls New York 14304

015177 | Report No 16 | November 04 2016

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1. Introduction

GHD has prepared this Statement of Qualifications (SOQ) to demonstrate the firm's capabilities to undertake the laboratory and data management for the Diamond Alkali Site - Lower Passaic River Superfund Site located in Newark, Essex County, New Jersey on behalf of Glenn Springs Holdings Inc.

GHD has been an industry leader in data management for over 25 years. GHD's laboratory and data management experience with Glenn Springs Holdings, Inc. (GSH) began in 1998. Since then, 129 GSH sites have been added to the Program.

With 75 data management professionals and chemists solely dedicated to the coordination, management and presentation of environmental data; GHD is uniquely qualified and already provides its expertise to Glenn Springs Holdings, Inc., and several Fortune 100 clients as their exclusive environmental data management provider. With this knowledge, we know we are able to apply our process successfully to the Diamond Alkali Lower Passaic River Site. ***Our process is a proven process***

We currently manage thousands of projects in an enterprise environmental data management system. Approximately one half of these projects are related to portfolio clients such as Glenn Springs Holdings Inc. (Occidental Petroleum), Union Pacific Railroad, Northrop Grumman, General Motors, Apache, TransCanada, Kodak, Pioneer, Anadarko, Conoco Phillips, and IBM.

Glenn Springs Holdings, Inc. has saved approximately $1M/year on analytical costs and has realized additional savings of 5 to 10 percent in rebates, late penalties, and corrected invoice errors relating to analytical work. Another client quantified their baseline costs and achieved savings of greater than 25 percent on lab and data management costs within the first year of initiating GHD's program.

2. GHD's Environmental Data Management Solution

GHD tailors each data management solution to fit the needs of our client. We work within the framework of their projects to manage their data without disrupting the flow of the project tasks. We coordinate with all members of the project team including clients, contract labs, consultants, etc. We provide the necessary training on our data management tools to the project team via web demos that can be recorded and made available as needed to project personnel. We have also managed collaborative websites to manage documentation, etc. for these projects.

It has been our experience that the introduction of a new data management system does not disrupt the flow of a project and is easily implemented.

2.1 Elements of GHD's Data Management Solution

GHD's 'life cycle' approach addresses the entire environmental data process; from our experience the entire lifecycle of the data must be considered to maximize the benefits of implementing an environmental data solution.

- Laboratory Procurement and Auditing
- Analytical Program Management
- Integrated Field Data Collection
- Sample Tracking and Management Services
- Data Validation Services
- Data Management
- Data Access
- Support Services

2.2 Laboratory Procurement and Auditing Services

GHD's chemistry staff is knowledgeable about laboratory accreditation programs throughout North America and participates in numerous "stakeholder" organizations to maintain a close relationship with the environmental laboratory industry. Consequently, GHD has in-depth knowledge of the capabilities and current accreditation status of numerous laboratories.

We have developed and maintained laboratory programs providing dependable and cost-effective laboratory services for our clients. GHD has successfully completed numerous projects by applying a "team" concept when contracting laboratory services and work with client-referred laboratories on a routine basis.

GHD also has significant laboratory auditing experience. We provide these services using applicable regulatory or client-specified guidance documents. Prior to auditing a laboratory, standard operating procedures (SOPs) for the analytical methods of interest are thoroughly reviewed.

2.3 Analytical Program Management

Data quality begins at the planning stage of a project. GHD has developed an analytical scoping tool that is comprehensive and ensures all parties involved with a sampling event are informed. This tool is in use for a number of GHD's clients and is well-received by the laboratories. It takes the guess work out of an analytical program and helps the labs to understand and help achieve project data objectives.

If a Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) are required, we have developed QAPPs for projects being performed under numerous regulatory programs across North America. GHD will work with the regulatory agency, client, and laboratory to ensure a scientifically

sound and cost-effective sampling and analysis program with the appropriate data quality objectives (DQOs) is developed for each project.

2.4 Sample Tracking and Management Services

The success of every field sampling program is dependent upon proper and routine communication between field sampling crews and laboratory project management staff. Sampling programs, sample turnaround times, and requested analyses often need to be revised during a sampling event due to unforeseen or unexpected field conditions. Additionally, field sampling staff may not be aware of project-specific analytical requirements or the laboratory will receive conflicting instructions from several field personnel. GHD has adopted the philosophy of "chemists talking to chemists" for our projects where a single chemist is responsible for communicating with the project team and the laboratory for every project.

This approach has proven to be successful as our chemistry group staff is trained in field sample collection techniques as well as being experienced with the laboratory techniques used to produce the analytical data. Although our sample tracking and management services are primarily provided for GHD projects, we have provided these services for clients that have third-party contracts for field sampling services. GHD's sample tracking and management services include:

- Coordinating the delivery of sample containers, shipping coolers, and sampling supplies (i.e., laboratory-grade field blank water) from the laboratory to the field sampling site
- Ensuring that sample shipments from the field arrived at the laboratory properly preserved
- Resolving sample documentation issues
- Ensuring the proper analyses and turnaround times are requested for each sample shipment
- Identifying samples with unique turnaround time requirements or special analyses
- Maintaining the integrity of field data (e.g., water levels, pH, conductivity) and sample identification information (e.g., field duplicates, MS/MSD samples) through the use of standardized spreadsheet templates that are completed by field sampling crews and electronically transferred to the database management team
- Arranging for recollection of samples when necessary before the field sampling crew demobilizes from the site
- Distributing preliminary and final data packages to the data users in a timely manner

These services are critical to the successful analysis of field samples in order to achieve the data quality objectives for every project.

2.5 Data Validation Services

Our environmental chemists have extensive experience validating all types of analytical data produced from various sample matrices. In general, the data validation procedure follows published United States Environmental Protection Agency (USEPA) guidance (e.g., "USEPA Contract Laboratory Program National Functional Guidelines for Organic/Inorganic Data Review") or other

applicable regulatory or client-specified data validation guidance documents, including the United States Army Corps of Engineers (USACE) Louisville Chemistry Guideline (LCG). GHD's data validation experience and expertise allows for sound professional judgment to be used when published guidance documents do not provide "cookbook" solutions to complex data quality issues. GHD's chemistry staff is trained in data validation by both internal and external experts in this field. Moreover, the vast majority of our chemists have produced or managed environmental data in a laboratory setting during previous employment. This experience is vital when validating laboratory data as our experience has proven that chemists who have produced and/or managed laboratory data are the most suitable to validate the data.

The output from the data validation process can be provided to the data user in a variety of formats (memoranda, reports) and data qualifiers are applied to laboratory results and presented in tabular data summaries. The database created for the project includes the data qualifiers from the data validation process and the reason for data qualification. This preserves the integrity of the database and precludes the need to manually apply data qualifiers to data summary tables prepared for future monitoring events at the same site.

2.6 Data Management

Our Environmental Data Management Group is dedicated to the management of data from a wide variety of environmental and water resources projects. This group is currently managing multi-source analytical chemistry data, in addition to other types of environmental data, from over 5,000 sites across North America. Rather than maintaining these data in a proprietary format, our philosophy is to make data electronically available to project teams in a variety of formats including on-line (Internet) and off-line (mass storage media).

We maintain environmental databases using Environmental Quality Information System (EQuIS) developed by EarthSoft, Inc. This database is compatible with laboratory electronic data deliverables (EDDs) provided by most laboratories. Additionally, EQuIS EDDs are becoming standard deliverable formats by many regulatory agencies including USEPA Regions 2, 3, 4, 5 and 7.

The range of services offered by our environmental data management team includes:

- Coordination of field sampling information, laboratory electronic data deliverables, and warehousing/management of new analytical data
- Compilation of historical/legacy data into standardized electronic databases
- Statistical analyses and reporting of analytical data
- Preparation of electronic site maps, and integration of environmental databases using e:DAT™
- Internal and client-specified programming applications
- Training of project teams on the use of environmental database management and Geographic Information Systems (GIS) tools

2.6.1 Historical Data Migration

GHD has more than 30 years of experience working with and migrating historical data into GHD's database management system. GHD has migrated historical data from various data sources including hardcopy, electronic, Access databases, SQL databases & Oracle databases. GHD has migrated historical data for Glenn Springs Holdings, Chevron, ConocoPhillips, General Motors, IBM, Aerojet, Kodak, Northrop Grumman Corporation, TransCanada and Union Pacific Railroad, along with various in-house clients. GHD has also performed three in-house data migrations, moving from older database management software to our current EQuIS 5 SQL database.

GHD has an experienced database staff that is trained to perform all aspects involved in migrating small to large scale historical data projects. As all of GHD's database analysts have worked with historical data, it provides GHD with a great resource to complete large historical data migrations in an efficient and cost effective manner. In order to streamline the process, GHD has developed a comprehensive standard operating procedure (SOP) to ensure that each database analyst uses a standard procedure for migrating historical data. GHD's database analysts are required to identify, document and resolve all inconsistencies, omissions and abnormalities associated with the dataset prior to migration. In addition, GHD uses data patterning along with programmed checks to assist with assessing the quality of the data. Upon completion of each database migration, it is GHD's standard practice to perform additional quality assurance and quality control checks to ensure the data have been migrated successfully. The final product for each database migration is a fully integrated historical dataset as well as a document outlining special conditions the database analyst encountered during the migration.

2.7 Client's Data Access

GHD has multiple options for end user data access as outlined below

a. *Geospatial Mapping Platform (GMP)*

   GHD developed this real-time cloud-based mapping system to facilitate the integration of field data, analytical data, documents, photos and geospatial information as data are generated.

   GHD uses iPad tablets enabling efficient collection of text, photos, geographic location and other related data in conjunction with GMP. The iPad application is customizable automating the collection of field data to GMP when data are borne. This strategy also supports integrated barcode scanning to further accelerate data collection and equipment management. Each tablet is equipped with rugged field cases allowing for safe and efficient data collection. Using cellular data connections or WiFi access points, data can be sent or received for quick communication with the project team. Field questions can be addressed immediately reducing time required in the field and improving collection quality.

b. *eDATpro™*

   eDATpro™ is a stand-alone project management application developed by GHD. This easy-to-use software has been a part of GHD's data management solution for 17 years on over 400 sites. This application requires no additional database or Geographic Information System (GIS) software. Photographs or project documents are spatially linked to site maps.

Applications include environmental monitoring, designated substance surveys, asset management projects and many other data-specific projects. Query results can be sent to the map or documents linked to the data records can be opened. These queries can be customized and stored in the eDATpro™ software. Combining all of this information into one tool permits the project team and all stakeholders to be on the same page regarding decision making and project progress. Additional information or a demonstration on eDATpro can be provided upon request.

c. *i:DAT™*

iDAT™ is a simple free-of-charge cloud-based system that allows users to query data and export in a standardized format.

d. *Project Portal©*

Project Portal provided by GHD Data Solutions is a cloud-based content management system that brings together data, documents, maps, schedules and team members with intuitive tools to access and manipulate project data. This data management system optimizes the speed and reliability of which data and documents are distributed and organized for access by authorized personnel.

2.8 Additional Services

GHD is recognized by our clients to be a full-service environmental remediation firm. Many of the services we offer are directly related to, and take great advantage of our data management expertise. These services include:

- Real-time Monitoring
- Geographic Information Systems
- Global Positioning Systems
- Computer-Aided Drafting and Design
- Three Dimensional Visualization using EVS
- Statistical Analysis
- Reporting and Statistics Software
- Groundwater Modeling
- Air Modeling
- Ecological Risk Assessment
- Human Health Risk Assessment
- Natural Resource Damage Assessment (NRDA)
- Monitored Natural Attenuation

3. Data Security

GHD houses its database server and information infrastructure in a GHD-owned and operated secure data facility (Data Center), employing state of the art technology. This facility is constructed with a concrete block exterior, and includes sufficient and significant uninterrupted power supply (UPS) and generator capacity and utilizes fully monitored environmental systems. This facility would ensure consistent availability of the client's data. GHD maintains a comprehensive daily backup and disaster recovery process for all data. System uptime is greater than 99.99 percent.

The Data Center is located at 34 Durward Place, and the Data Recovery Centre is located at 40 Bathurst Drive, both situated in Waterloo, Ontario separated by a distance of approximately 1.5 miles.

The Data Center is monitored 24 hours per day, 7 days per week for physical security as well as fluctuations in power and temperature. Physical security monitoring includes video surveillance, verification for access and the recording of all visitors, including available escorted access.

The facility is equipped with a cooling (HVAC) system and a CO_2 fire detection and suppression system. Preventative maintenance checks are conducted monthly on the power infrastructure and HVAC systems and annually on the CO_2 fire detection and suppression systems. All components of the power infrastructure, HVAC, and fire suppression systems have 24/7 maintenance contracts, allowing any problems to be addressed very quickly by factory trained technicians.

A variety of redundant systems reinforce the security of the Data Centre, in that if one system should fail, another is available to carry the load. These systems include:

- Fail-over to battery power and a diesel generator (with minimum 2.5-day fuel capacity on hand at all times)
- HVAC (air conditioning) systems
- Fiber cable connections

4. Relevant Experience

GHD has provided proven and reliable data validation and data management solutions for hundreds of projects throughout North America. We believe that our single greatest attribute is our group of laboratory and environmental data management professionals and their ability to work on a team. GHD routinely manages large sets of environmental data for many portfolio clients (see below). These portfolios include projects being performed under Superfund, RCRA, and various state programs. Our staff is extremely adept at identifying our role on a project team, and then working within that role to meet or exceed client expectations. As seen below, GHD has vast experience working on data management portfolios that include one to many consultants other than GHD. We have immense experience in project management but are just as comfortable in a support role on the project team. Our experience is that many portfolio client projects are managed by other consultants and GHD provides lab and data management services only. GHD has a highly

trained and specialized staff to providing comprehensive laboratory and data management services solutions for the past 28 years. A partial listing of representative projects and references is presented in Appendix A.

GHD has relevant experience with GSH. GSH's objective was to obtain usable, consistent and accurate analytical data in a timely manner and at a competitive price.

Prior to the program, approximately 100 consultants and 50 different analytical laboratories supported the client's project portfolio. The data were maintained in various formats resulting in:

- Inconsistent data formats
- Poor control on pricing
- Poor knowledge of overall spending
- No control of data
- Data quality issues
- Data was the basis for decisions costing potentially millions of dollars
- No common approaches
- No sharing of lessons learned

GHD developed a single process to address the client's needs by limiting the number of consultants, contracted only seven laboratories and negotiating pricing 30 percent lower for an estimated $1 million savings in the first year, developed standardized inputs for field/laboratory data, centralized data in an enterprise repository facilitating site and/or portfolio wide searches, reducing validation time for a 50 percent savings, and provided a standardized smart map (GHD's e:DAT™), stores project documents, photos, data and figures for the project group's use. This process is reviewed monthly with the use of program metrics to further enhance the program.

With this program, the client identified that they were able to:

- Take back control and reduce costs
- Eliminate or better manage the middle man and eliminate markups
- Better control with fewer laboratories
- Automate systems whenever possible

Table 4.1 Current Data Management

Client	Sites	Database Records	Consultants	Labs
Chevron	598	2.4 mil	4	25
Conoco Phillips	295	6.9 mil	2	17
GM	40	3.9 mil	5	74
IBM	11	4.8 mil	5	46

Table 4.1 Current Data Management

Client	Sites	Database Records	Consultants	Labs
Aerojet	1	4.7 mil	1	19
Kodak	14	2.5 mil	4	47
NGC	55	3.1 mil	8	68
TransCanada	62	1.5 mil	8	19
Occidental	194	8.0 mil	>20	186
UPRR	594	4.1 mil	5	41

5. Expertise

GHD's biggest asset is our people. GHD has emphasized the employment of high quality professional and technical personnel capable of performing a variety of services to meet the multifaceted needs of our clientele.

- GHD employs a staff of 25 professionals specializing in lab procurement, chemistry and data validation services. Our staff is experienced and all GHD chemists have significant experience working in commercial laboratories.
- GHD employs a staff of 15 professionals specializing in GIS, geospatial representation and 3 and 4-D visualization.
- GHD employs a staff of 10 professionals specializing in application development.
- GHD employs a staff of 25 professionals specializing in data management. Our data analysts support approximately 5,700 projects representing 75 million records in the repository.

We support each project with dedicated team approach. For GSH, we expect to dedicate approximately 20 to 25 information specialists from technical/system support, application developers, chemists, GIS technicians and database analysts with the ability to dedicate more individuals as needed. Appendix B presents curricula vitae (CVs) for key project members.

GHD will employ the use of metrics using Value Stream Mapping (VSM) process brought to GHD by General Motors (GM). VSM is a lean technique used to analyze the flow of materials and information, identify opportunities for improvement, and modify the process to optimize the process. The end goal is to produce more value with less work and less cost. Using this technique, we improved the efficiency of GM's data management process and reduced lead times by more than 50 percent. GHD was honored to receive the GM's prestigious 2004 Crew Award for our efforts in data management.

GHD customized programming solutions utilize industry proven software architect design patterns that support client/server applications at the enterprise level. Predominately offering Microsoft solutions due to the nature of the business world we also look to other platforms to ensure we provide the best solution technology has to offer. Where custom client tailored solutions aren't

required, GHD stays abreast of current industry software offerings to help clients make purchasing decisions and coordinate roll out to all the members involved such as regulatory bodies, external consultants and field staff. Some of the areas we have excelled over the years include the following:

- Cloud based hosting
- Mobile applications
- Self-serve, report ready data extracts
- Data collection tools
- Automated data collection and processing

Issues like scalability, security, and fault tolerance are always considered by taking an n-tiered approach that when implemented correctly will minimize complexity, keep deployment and continued maintenance costs down yet efficiently take advantage of the network topography available. GHD to host applications take advantage of a robust corporate data center with significant reinforcement inherent in its design and a dedicated department of individuals to ensure uptime. These applications are built in a virtualized environment we can quickly reallocate processing, memory and storage on all our servers.

Within GHD's Family of companies is our website design company, eSolutionsGroup Limited, staffing 55 professionals supporting website design, online branding and creative design in a multimedia environment. We have produced numerous online training videos to support processes and educate users upon rollout of Data Management Programs and would expect to use this resource for GSH.

Appendices

Appendix A
Client References and Relevant Experience

1. GHD Client References

1. Union Pacific Railroad Company (UPRR)
   Mr. Geoffrey Reeder, Program Manager
   24125 Aldine Westfield Road
   Spring, TX 77373
   Phone: 281-350-7197

2. Northrop Grumman Corporation (NGC)
   Mr. Kurt R. Batsel, P.E.
   The Dextra Group, Inc.
   #446
   1205 Johnson Ferry Road, Suite #136
   Marietta, GA 30068
   Phone: 770-578-9696

3. General Motors (GM)
   Ed Petersen, Program Manager
   GM Tech Center, 30200 Mound Road
   Warren, MI 48090
   Phone:313-506-9468

2. Lab and Data Management Portfolios

2.1 General Motors

GHD provided enterprise Laboratory and Data Management Program (LDMP) for 90 of General Motors' (GM) sites since 2003. GM's objective was to centralize the data management services with a single provider. The use of GM's lean technique called Value Stream Mapping was employed to streamline and map the process for all stakeholders.

GHD developed a process to address the client's needs by limiting the number of consultants, contracted only seven laboratories and negotiating pricing 30 percent lower for an estimated $1 million savings in the first year, developed standardized inputs for field/laboratory data, centralized data in an enterprise repository facilitating site and/or portfolio-wide searches, reducing validation time, and provided a standardized smart map (GHD's e:DAT™) storing project documents, photos, data and figures for the project group's use. This process is reviewed monthly with the use of program metrics (GHD's e:Tracker™) to further enhance the program.

As a result, GM has saved over $2 million to date and reduced the process time for sample collection through having fully validated data in the database from 84 days to less than 43 days (including laboratory analysis time). GHD received GM's 2004 Crew Award for this program.

2.2 UPRR

Union Pacific Railroad (UPRR) has 314 sites in their site-wide portfolio for which GHD provides data management services. UPRR's program objectives were to centralize data management services to facilitate a common process, metric generation and realize cost savings.

GHD utilized a proven process to address the client's needs by developing standardized inputs for field and laboratory data, centralizing data in an enterprise repository facilitating site and portfolio-wide searches, providing a self-serve web application for consultants to query and export data, and monthly metrics displaying turnaround times for all process steps.

Upon optimizing the program, additional modules were deployed to generate regulatory deliverables for state compliance, centralize the data validation, and manage the laboratory program. These modular components, in addition to the program components, have satisfied UPRR's objectives.

Within the next 6 months, GHD intends to deploy an automated field data collection module providing further cost savings to UPRR.

Appendix B
Curricula Vitae

Denise Robinson Anderson

(formerly Tuhovak)

Senior Chemist/Principal

Qualified (Education): Bachelor of Science/Bachelor of Chemistry (BSc) 1986

Connected (professional affiliations): Member of American Chemical Society

Professional Summary: Denise helped develop and manage GHD Data Solutions Program, an innovative service line designed to help companies obtain quality analytical data and to manage and access the data. The group includes 50 chemists and innovative technology (IT) professionals throughout the United States and Canada. Under this program, clients have realized significant savings as a result of GHD's efficiency at data management and leverage to obtain highly competitive laboratory rates.

Program Manager
Environmental Laboratory Management Programs
Multiple Fortune 100 Clients

Development, implementation, and administration of enterprise-level laboratory programs for various clients. These programs include assessment of laboratory quality via laboratory audits, review of laboratory standard operating procedures, and review of laboratory proficiency results. GHD's experienced chemistry staff executes all tasks associated with project analytical requirements including analytical scoping/method selection, data validation, quality control issue resolution, method development, and laboratory interface.

Under these programs, GHD's considerable purchasing volume is used to negotiate highly competitive pricing on laboratory services.

Program Manager
Environmental Data Management Programs
Multiple Fortune 100 Clients

Development, implementation, and administration of enterprise-level data management programs for many clients from various industries. These programs are tailored specifically for each client to provide data in a consistent format using efficient, high quality processes that are cost effective. The systems include software developed by GHD to access the data in various formats.

GHD has saved clients approximately 35 percent on these services while providing client full access to their data.

Project Chemist
Data Validation and Quality Control
Many Remediation and Compliance Projects

Project chemist managing all tasks related to analytical requirements for a wide variety of projects including:

- Assessment and validation of data in accordance with various state and regional EPA agencies including United States Environmental Protection Agency (USEPA), National Functional Guidelines, Region III, TRRP, etc.
- Preparation of analytical Quality Assurance Project Plans (QAPPs) and Site Sampling and Analysis Plans
- Liaison with USEPA/State Agencies regarding Quality Assurance Quality Control (QA/QC) issues for various analytical programs
- Performance of laboratory audits and assessments
- QA/QC Officer for numerous Superfund and Resource Conservation and Recovery Act (RCRA) investigation and remediation programs
- Oversight and review of analytical testing in support of compliance programs under the Clean Water Act

Work history

April 1993 – present	GHD (formerly Conestoga-Rovers & Associates) Fort Myers, FL Named Principal/Vice President 2005
1990 - 1993	Laboratory Manager, Advanced Environmental Services, Niagara Falls, NY
1988 - 1990	Research Chemist, Wilson Greatbatch Ltd., Clarence, NY
1986 - 1988	Analytical Chemist, Recra Environmental Corp., Amherst, NY

Denise Robinson Anderson

(formerly Tuhovak)

Senior Chemist/Principal

Other related areas of interest

Recognized (Certifications/Trainings)

- XYZ's of Field Analytical Techniques, Pittsburgh Conference, 1996
- USEPA Region II Training Course for CLP Inorganic Data Validation, Westchester Community College, Dr. John Rankin, March 1995
- Hazardous Waste Management: The Complete Course, Environmental Resource Center, 1995
- USEPA Region II Training Course for CLP Organic Data Validation, Westchester Community College, Dr. John Samulian, June 1993
- DuPont Differential Scanning Calorimeter Training Course, 1990
- Varian Gas Chromatography Training Course, 1989
- Mattson FTIR Training Course, 1988

Awards

- General Motors Worldwide Facility Crew Award, 2005:
  - Exceptional service related to Environmental Indicators Team

Published Referenced Papers

- W. F. Carroll, Jr., T. C. Berger, F. E. Borrelli, P. J. Garrity, R. A. Jacobs, J. Ledvina, J. W. Lewis, R. L. McCreedy, T. P. Smith, D. R. Tuhovak, and A. F. Weston, "Characterization of Emissions of Dioxins and Furans from Ethylene Dichloride, Vinyl Chloride Monomer and Polyvinyl Chloride Facilities in the United States. Consolidated Report," Chemosphere 2001, 43, 689-700
- K. Stagg, D. Tuhovak, and M. Beard, "Managing Data Quality: What does your chemical result mean?" Envirosoft 2000 Conference Proceedings, Bilbao, Spain, June 28 to 30, 2000
- W. F Carroll, Jr., T. C. Berger, F. E. Borrelli, P. J. Garrity, R. A. Jacobs, J. Ledvina, J. W. Lewis, R. L. McCreedy, T. P. Smith, D. R. Tuhovak and A. F. Weston, "Characterization of Emissions of Dioxins and Furans from Ethylene Dichloride, Vinyl Chloride Monomer and Polyvinyl Chloride Facilities in the United States, Consolidated Report, IV, Dioxin 99 18th Symposium on Chlorinated Dioxins and Related Compounds, Venice, Italy, September 12 to 17, 1999
- W. F. Carroll, Jr., T. C. Berger, F. E. Borrelli, R. A. Jacobs, J. Ledvina, J. W. Lewis, R. L. McCreedy, T. P. Smith, D. R. Tuhovak, and A. F. Weston, "Characterization of Emissions of Dioxins and Furans from Ethylene Dichloride (EDC) Vinyl Chloride (VCM) and Polyvinyl Chloride (PVC) Facilities in the United States. IV. Consolidated Report, "Organohalogen Compounds 1999, 41, 31-34
- W. F. Carroll, Jr., T. C. Berger, F. E. Borrelli, J. W. Lewis, R. L. McCreedy, T. P. Smith, D. R. Tuhovak, and A. F. Weston, "Characterization of Emissions of Dioxins and Furans from Ethylene Dichloride (EDC) Vinyl Chloride (VCM) and Polyvinyl Chloride (PVC) Facilities in the United States. III. Oxychlorination Catalyst," Organohalogen Compounds 1999, 41,133-136
- W. F. Carroll, Jr., F. E Borrelli, R. A. Jacobs, J. W. Lewis, R. L. McCreedy, D. R. Tuhovak, and A. F. Weston, "Characterization of Emissions of Dioxins and Furans from Ethylene Dichloride (EDC) Vinyl Chloride (VCM) and Polyvinyl Chloride (PVC) Facilities in the United States. II, IIa. Wastewater Treatment Solids and Aqueous Hydrochloric Acid," Organohalogen Compounds 1997, 32, 447-450
- D. Tuhovak, E. Takeuchi, and C. Post, "Low Temperature Electrolytes for Lithium/Silver Vanadium Oxide Cells", *Journal of Power Sources*, 34, 1991, 51-64

Presentations

- Unlocking the Power of Your Data, Without Derailing Your Operation, Railroad Conference, University at Illinois Urbana-Champaign 2008 (with Union Pacific Railroad)

Scott Bruce
GIS Project Coordinator

Qualified (Education): B.Sc., Environmental Hydrogeology, 1998, University of Waterloo

Professional Summary: Mr. Scott Bruce is an environmental hydrogeologist and GIS specialist with over 17 years of experience in hydrogeologic evaluations and environmental database management. Mr. Bruce received his Bachelor of Science in hydrogeology from the University of Waterloo in 1998. Experience with hydrogeologic evaluations includes pumping test analysis, hydraulic parameter estimation, groundwater flow and contaminant characterization and reporting. With this experience, Mr. Scott Bruce assists GHD's Geographic Information Systems (GIS) team interpret the environmental data used in GIS solutions. His responsibilities as a GIS project coordinator include software training, requirements gathering, internal software design, software/data management support and mobile data collection implementation.

GIS and Environmental Data Manager

Software Design and Implementation
Environmental Holdings Company | Dallas, TX | 2000 ongoing

The client is an environmental holdings company that manages sites across United States. Scott's role as project coordinator includes reviewing client requirements, coordinating GIS staff as well as conducting project meetings and training with the client's national team of consultants. Scott designs, implements, and trains users on software that integrates site maps, monitoring locations, site documents, digital photographs, and environmental databases into a GIS. This allows all stakeholders to have access to the same up to date site environmental data.

GIS Project Coordinator
Oil and Natural Gas Exploration and Production Company | Denver, CO | 2014 ongoing

The client is an oil and natural gas exploration and production company. The goal of the project was to provide the field consultant, data analyst and client with up to date site information. Natural gas production sites are sampled weekly across the state of Colorado. Scott implemented a GIS system allowing analytical data, sample photographs and field sample sheets to synchronize to the entire project team. This allows the data analyst to review the data in a timely manner so issues can be relayed to the client and sample collection team immediately.

GIS Project Coordinator
IT Consultant | Broome County, NY | 2007 ongoing

The client is an American multinational technology and consulting corporation. The client is required to install and maintain remediation equipment for indoor air quality. This work generates numerous documents including access agreements, fire marshal reports, maintenance checks, and annual letters. With over 800 properties, the client needed a way to quickly access and organize this information. Scott designed and implemented software tools that could quickly filter this data by owner, street address, document availability or type. This enables the client to retrieve required documents in a timely manner.

GIS Project Coordinator
Global Aerospace and Defense Technology Company | Fairfax County, VA | 2009 ongoing

The client is an American global aerospace and defense technology company. Scott designs, implements and trains users on software that integrates site maps, monitoring locations, and environmental databases into a GIS. This allows all stakeholders to have access to the same up to date site environmental data. This software solution also included many customized queries allowing the client to compare environmental data to regulatory criteria.

Mobile Data Collection

Mobile Data Collection Implementation
Railway Property Sampling | National Railway Company | Atlantic Canada | 2012 ongoing

The client is a North American railway company. Several field teams were deployed to sample ore along every property line of a section of the client's railway. To improve reporting speed, Scott implemented a mobile data collection solution. The final result was the automation of over 4000 pdf reports displaying sampling information, photographs and results. These were integrated into a GIS solution making it easily accessible to the client, project manager and field sample teams.

Mobile Data Collection Implementation
Hydrogeologic Investigations | Chemical Company | Southern Ontario, Canada | 2013 ongoing

The client is a global specialty chemicals company. Quarterly environmental reporting requires several field teams to collect over 500 water levels across the entire city. Scott implemented a mobile data collection solution that allows for easy field review of previous readings and

expedited import into a SQL database. This solution eliminated all errors associated with transcribing field notes. It also allowed for faster reporting including well maintenance reports and potentiometric contours so that results can be reviewed immediately. These data are also integrated into a GIS solution making it easily accessible to the entire project team.

Work history

2005 – present	GHD (formerly Conestoga-Rovers & Associates), Ottawa, ON
1998 – 2005	Conestoga-Rovers & Associates, Waterloo, ON

Other related areas of interest

Recognized (Certifications/Trainings)

- OSHA 40-hour Hazardous Waste Worker, Refresher, 2015
- EQuIS for ArcGIS I and II, 2013
- LNAPL Transmissivity, Midwest Geosciences Group, 2011
- Advanced Aquifer Testing Techniques, Midwest Geosciences Group, U of Miami, 2006

Key Experience Areas

- Geographic Information Systems
- Software Design and Implementation
- Mobile Data Collection
- Environmental Data Management
- Unmanned Aerial Vehicle Imagery
- Hydrogeology

Paul Fowler
Database Manager

Qualified (Education): Diploma, Computer Programmer Analyst, Conestoga College, 2000-2003

Professional Summary: Paul has 10 years in developing and maintaining multiple project databases for major client portfolios. Creates, maintains, mines, and analyzes new and legacy environmental data of several clients using Microsoft Access databases, various environmental software packages and tools developed by GHD. Provides assistance to laboratories in generating EDDs (Electronic Data Deliverables) and provide help for troubleshooting errors encountered by the laboratories.

Database Manager

Major Project Portfolio | Multiple Facilities in United States | On-going

Paul is the database manager/coordinator for a large lab and data management services contract, coordinate efforts between client, lab, and project consultants, chemists for over 130 facilities.

Database Manager

Spill Response | ON

Paul provides database assistance for rush spill response projects located in Ontario. Assistance is provided for rush data validation, and table/figure requests.

Database Manager

Calvert City, KY | On-going

Paul provides database assistance for a major litigation project located in Calvert City, Kentucky. Assistance is provided for the management of client data in a 3rd party hosted database, and table, figures, and custom exports.

General GHD Administration/Coordination

- Primary Environmental database Analyst for 25+ chemical databases for sites in both the United States and Canada.
- Maintain and file reports and documentation in conformance with legislation, regulations, and standards.
- Trained new staff and subcontractors on CRA database management procedures and database software tools.
- Manage analytical reference tables for the database group, which consist of over 20 staff.
- Generates agency deliverables for Region 2, Region 5, New York State, California Geotracker, and New Jersey Hazsite.

Programming/Technical

GHD

- Designed several MS Excel VBA applications to systematically check and correct, data completeness, formatting that enabled greater efficiencies and accuracy.
- Designed a custom MS Excel, MS Access VBA application to produce a custom agency performance monitoring report, West Virginia, United States.

Programming

Crane Plumbing | Stratford, ON

- Developed a web based human resources application to track and manage factory employees time worked. (HTML, MYSQL, SQL Server, ASP, Adobe Flash).

Work history

August 2004 - present	GHD (formerly Conestoga-Rovers & Associates), Waterloo, ON

Other related areas of interest

Awards

- AECON Award of Excellence, Computer Programmer/Analyst, Conestoga College,2003

Andrew P. Kisiel

Geologist / Hydrogeologist

Qualified (Education): B.A in Geology, State University of New York at Buffalo, 1985

Professional Summary: Project Manager for a Lab and Data Management Program with over 100 environmental sites; coordinate efforts between project teams, labs, and the chemistry and database group. Provide data management support and coordination for portfolio clients and for various project teams. Manage all aspects of environmental data as well as program metrics, financial tracking, and invoicing.

EXPERIENCE

Project Manager/Coordinator
Various Projects | Client Confidential | Various Locations

Project Manager/Coordinator for a large Lab and Data Management Services Contract; coordinate efforts between client, lab and project consultants, chemists and data analysts for over 100 facilities.

Database Manager/Coordinator
Various Projects | Various Clients | Various Locations

Coordinate, create, maintain, mine and analyze new and legacy environmental data of several clients using SQL and Access databases and environmental software packages. Manage all aspects of environmental data as well as program metrics, financial tracking, and invoicing.

Project Manager
Solid Waste Landfill | Client Confidential| New York

Primary environmental database manager for solid waste landfill facility

Project Manager
Storm Water Project | Client Confidential | Client | Niagara Falls, New York

Responsible for the management of a storm water sampling program at a Niagara Falls, New York industrial facility.

Project Coordinator
Groundwater Monitoring | Client Confidential| Niagara Falls, New York

Project Coordinator for a corrective measure implementation groundwater monitoring program at a Niagara Falls, New York industrial facility.

Project Geologist
Groundwater Monitoring | Client Confidential| Michigan

Geologist for a corrective actions groundwater monitoring program at a former manufacturing facility in Michigan.

Project Geologist
Groundwater Investigation | Client Confidential| Pennsylvania

Geologist for a groundwater and soil investigation and monitoring program at former tear gas manufacturing facility in Pennsylvania.

Project Geologist
Groundwater Investigation | Client Confidential| Maryland

Geologist for groundwater, surface water, and soil investigations at a commercial, residential, and demolition waste landfill in Maryland.

Other
Various Projects | Various Client | Various Locations

Assisted project managers in coordination of all aspects of site characterization and remediation projects, including:

- Drilling oversight
- Providing technical assistance to field and staff personnel
- Data analysis via SQL and Microsoft Access databases
- Preparation of reports
- Supervision and analysis of hydrogeologic investigations to determine aquifer characteristics including single well response tests and constant-rate and step drawdown pumping tests in unconfined and confined aquifers.
- Supervision of bedrock injection testing to determine aquifer hydraulic conductivity.
- Supervision and coordination of field investigations including drilling and sampling programs conducted at various hazardous waste disposal sites and other industrial facilities.

- Supervision of overburden and bedrock monitoring well installations.
- Supervision and implementation of groundwater monitoring and sampling programs undertaken in conjunction with hydrogeologic investigations.
- Surface and subsurface soil sampling.
- Site supervisor in environmental assessments of industrial properties.

Work history

1989 - present	Geologist / Hydrogeologist, GHD (formerly Conestoga-Rovers & Associates), Niagara Falls NY
1987 - 1989	Geologist, Conestoga-Rovers & Associates, Niagara Falls NY
1985 - 1987	Graduate Teaching and Research Assistant, Geology Department, State University of New York at Buffalo

Other related areas of interest

Recognized (Certifications/Trainings)

- Completed course/field requirements toward M.A. in Geology, State University of New York at Buffalo, 1987
- Hydrogeology, Computer Modeling in Hydrogeology, Geochemistry, Petroleum Geochemistry, Biostratigraphy, Carbonate Geology, and Volcanology courses, State University of New York at Buffalo, 1986-1988
- Earthsoft EQuIS Database Training Seminar, May 2000

Published

Published Refereed Papers

- The geology of Picacho Butte, a silicic volcanic dome in northwest Arizona. In NASA, Washington, Reports of Planetary Geology and Geophysics Program, 1986 p 371-3 (SEE N87-23341 16 91), May 1987; Kisiel, Andrew P; King, John S.

Susan Scrocchi
Senior Chemist

Qualified (Education): Bachelor of Science, Chemistry (BSc) 1983 Canisius College

Professional Summary: Susan's professional experience as a chemist includes laboratory procurement, data validation and assessment, performing organic analyses, and being a liaison with the laboratory for various investigative and remedial projects. The contaminants associated with these projects include volatile and semi-volatile organics, pesticides, polychlorinated biphenyls (PCBs) (Aroclors and congeners), herbicides, metals and inorganics, petroleum hydrocarbons, and chlorinated dibenzo-p-dioxins and dibenzofurans. In addition, Susan has experience performing laboratory audits and preparing analytical Quality Assurance Project Plans (QAPPs). Susan also has basic training in database using Microsoft Access.

Project Chemist
Chemical Company, Various US Sites
1996 - Present

Susan assists a major chemical company client on various sites across the United States with sampling setup, validation and verification of sample results, and sample tracking. Responsibilities include assisting with work plans and QAPP preparation, contracting laboratory services for the projects, being the technical liaison with the contracted laboratory, and submitting validation reports in a timely fashion.

Program Chemist
Multiple Fortune 100 Clients

Susan is responsible for the administration of enterprise-level laboratory programs for various clients. These programs include assessment of laboratory quality via laboratory audits, review of laboratory standard operating procedures, and review of laboratory proficiency results. Once the laboratory is selected, Susan is then responsible for analytical scoping/method selection, data validation, quality control issue resolution, method development, and laboratory interface.

Under these programs, metrics are collected and shared with the clients showing cost savings and project completion times.

Project Chemist
Large Automotive Client, Ongoing

Susan provides data review and data validation in support of the investigation and remediation activities for multiple automotive client sites. Susan is also responsible for contracting laboratory services for the projects when necessary and for being the liaison with the contracted laboratory to make sure project samples are analyzed and reported in a timely fashion.

Project Chemist
Data Validation and Quality Control
Many Remediation and Compliance Projects

Project chemist managing all tasks related to analytical requirements for a wide variety of projects. Responsibilities include assessment and validation of data in accordance with various state and regional EPA agencies; preparation of QAPPs; liaison with United States Environmental Protection Agency (USEPA)/State Agencies regarding quality assurance/quality control (QA/QC) issues for various analytical programs and performance of laboratory audits and assessments.

Database Analyst
Various Clients, 2011 - Present

Susan is responsible for the data import and maintenance of the database for a large oil company. Susan also has basic training in Microsoft Access and is able to produce flat files for data validation and analytical tables.

Work history

April 1996 – present	Senior Chemist, GHD (formerly Conestoga-Rovers & Associates), Niagara Falls, New York
1983 – 1996	Organic Chemist, Advanced Environmental Services

Other related areas of interest

Recognized (Certifications/Trainings)

- USEPA Region II Training Course for CLP Organic Data Validation, March 1997
- 40-Hour HAZWOPER Occupational Safety and Health Administration (OSHA) Training (per 29 CFR 1910.120), 2000
- 8-Hour HAZWOPER Refresher OSHA Training (per CFR 1910.120), Annually

Joseph Vander Linden

Geologist/Data Manager

Qualified (Education): Bachelor of Science – Geological Sciences (BA), 1993

Professional Summary: Joe has 20 years in managing and designing data management systems. He has developed many applications to assist in the collection of field information, including groundwater sampling data, asset management information, waste management, treatment systems, and hydrogeologic information. He also designs reporting systems that efficiently produce tables, graphs, charts, contour maps, and other project deliverables for the database group and the project team. Joe's excellent communication skills, field, and project management experience allow him to develop data management systems that work for all members of the project team.

Data Management Portfolios

EXPERIENCE Chemical, Oil and Gas, Technology, Manufacturing

Project Manager

Laboratory and Data Management Program | Chemical Sector | 100+ Projects

Managed the data management program for a client in the chemical/oil and gas industry. Provide day-to-day support for 25+ consultants on over 100 distinct projects. The data management program has standardized the client's deliverables, reduced the turn-around time of their data management services, and leverages the client's volume for laboratory analysis reducing the program's cost by an estimated 20 percent.

Data Management Programming

Project Manager

Contour Automation Tool | Various Projects

Managed the design, programming, and implementation of a tool to automate groundwater contour maps and chemical concentration maps. The tool extracts data from the central SQL Database or from a standard eDAT database, krigs, and contours the data using Surfer. The tool is used by the project team members to manage hundreds of sites within various sectors, including the oil and gas sector. Reduced the effort to create the contour maps.

Programmer/Designer

Data management services | Client | Niagara Falls, NY

Created a user-friendly Microsoft Excel spreadsheet with data entry forms and reports to record client onsite laboratory analytical results, summarize treatment plant operator information, and calculate loadings for discharges from the treatment system. The database merged data with the site database and GIS software managed by GHD. The program standardized the data input process and essentially eliminated the time to generate the required report deliverables.

Project Manager

eTracker | Internal Tool | Various Projects

Designed and managed the programming of GHD's web-based data management tracking software eTracker. Software includes a Microsoft SQL database on a web server, automated email notifications of items due and performance metrics. The software has enabled the data management group to track the progress of deliverables within the data management group and document the reduced turn-around time associated with using GHD's data management group.

Programmer/Designer

Data Management Services | Chemical Industry | Lathrop, CA | 2005-2012

Created a process which combined data from the client groundwater treatment plant PLC, operator notes, flow measurements, and laboratory analytical data to produce a single monthly summary report. The information allowed the client to measure the efficiency of their carbon treatment system, maximize the utilization of their carbon, and predict when the next carbon change would be required. Automated an additional 30+ tables, graphs, and report figures which the project team was able to generate without effort from the database group, including:

- Extraction well flow rate graph
- Chemical mass removed graph
- Monthly summary table of treatment system flow rates
- Groundwater elevation hydrographs
- Differential pressures across key treatment system components
- Report on possible missing data

Joseph Vander Linden
Geologist/Data Manager

Project Manager

Shipping Database | Internal Tool | Various Projects | 2008-present

Designed and implemented a database system to manage shipping charges within the company. The database allowed the accounting department to:

- Utilize the electronic invoices from Fed-Ex
- Reference valid project codes from the GHD accounting system
- Provide a summary of items which did not have sufficient information to invoice
- Provide a line-item export to submit to Fed-Ex to coincide with the invoice payments
- Create an Excel summary of the charges for inclusion in GHD's accounting system
- Create a summary report to send to the client summarizing their charges

The database has reduced the Fed-Ex invoice processing time by 50 percent. Three months after implementation the unbilled shipping charges were reduced by over $200,000.

Project Manager, Programmer

AgMonitor | Internal Tool | Modesto, CA| 2010-2014

Created a Microsoft Access database which enabled the GHD Agriculture group to track nutrient applications and draws for growers in California. The database records:

- Herd information
- Crop, groundwater, wastewater, compost, and fertilizer information from
  - Laboratory chemical analysis
  - Application volumes/mass
  - Exports/harvests

Historical laboratory analysis of crop, water, and compost samples can be applied to the nutrient budget to provide field-specific estimates over equivalent book values. The database also created the Dairy Facility Information Annual Report. The Annual Report from the database was approved by the California Water Board as a valid submission, equivalent to the Merced County website, one of only two entities to receive this approval at the time. The database enabled the client to enter their nutrient information as it was received from the fields, laboratory, and subcontracted growers. The tables and graphs from the Annual Report could be generated during the year to proactively manage each field's nutrient ratio and ensure compliance.

Hydrogeology

Project Hydrogeologist

Corrective Action Monitoring Plan | Chemical Industry Client | Tacoma, WA | 1998-2004

Managed the activities associated a Corrective Action Monitoring Plan including:

- Groundwater sampling
- Monitoring well drilling
- Hydraulic monitoring events and pumping tests
- Slug testing of monitoring wells
- Preparation of agency reports

Created a database to compile information from 100+ transducers, treatment system extraction/monitoring wells, and laboratory specific gravity information to create 72-hour average groundwater potentiometric surface maps correcting for groundwater density variations in a tidal plane. Included VBA code and Quick Keys macros to reduce report preparation time by approximately 40 hours. The database also enabled the project team to monitor historical trends in extraction well levels and proactively develop wells where precipitate was clogging well screens.

Work history

January 2001 – present	GHD (formerly Conestoga-Rovers and Associates), Niagara Falls, NY
March 2000 – January 2001	Staff Hydrogeologist, Geomatrix Consultants, Inc.
August 1994 – March 2000	Field Technician, GHD (formerly Conestoga-Rovers and Associates), Niagara Falls, NY

Other related areas of interest

Recognized (Certifications/Trainings)

- OSHA 40-hour Hazardous Waste Worker, Refresher, 1994-prese